The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Encouragement for the Researcher

AMIDST the distressful news of battle, murder and sudden death there comes at times evidence that the arts of peace are still pursued and that there are in the world people who can foresee that they will once more become predominant in due season. Amongst these evidences there was the recent announcement of the Beilby Memorial awards, which are given in memory of a great scientist, the first Director of the Fuel Research Board, for outstanding work in fuel economy, metallurgy and chemical engineering. Research work is generally its own reward, but something tangible of this nature is encouraging to those who would otherwise receive nothing more than the publication of a paper and the assurance that their work was acknowledged by their colleagues and compeers to be good even though it is very often criticised with more or less acerbity by others in the same branch of science.

There are awards of various kinds in this field. Some Institutions and Societies give medals; Universities give doctorates; or the encouragement may take the form of monetary awards, and these are often the most valuable for they provide the means whereby books and instruments may be purchased to enable further research to be undertaken. In a different, and perhaps still more useful, category are the research fellowships, which not only provide evidence that the research worker is highly esteemed among his fellows, but also afford him the means to continue his researches unhampered by the worldly cares that compel most of us to take thought for the morrow.

We recollect being present at a degree institution at one of our greatest universities when, having presented the degrees, the caps and gowns and the parchments being worn or firmly held in the hands of the recipients, the Chancellor addressed the gathering. To the Doctors he made congratulatory sounds, and then uttered the admonition that on no account must they consider that their work was done now that they had had a thesis accepted for the degree. This, he pointed out, was but the beginning; because they had shown themselves gifted above their fellows in the arts of research, it was their duty to continue their work that they might give more and yet more to the world.

There is nothing more fascinating than scientific research to those who have the gift for it. The pleasures to be derived from it are great, and probably transcend the pleasures of all other types of human activity. There is the continual interest in discovering what are the results of experiment; there is fascination in planning and assembling new apparatus to enable the results to be secured; and there is the over-riding joy of having solved difficult problems and of wresting secrets from nature that have been preserved for eons of time. But there, all too often, the reward ceases. It may be that the research worker can afford to work by himself, and that in so doing he may hit upon patentable ideas; many of the more academic research workers lose interest at this stage; that, they say, is commercialism, and should be left to the industrialists and the financiers. To a great extent they are right, for the research worker cannot generally concentrate upon the economic application of his work and also continue to give of his best as a research worker.

The research worker is the insurance of an industrial firm against being overtaken by its competitors. The academic research worker shares with his industrial colleague the duty of providing that the nation shall not fall behind in the discovery of scientific knowledge. The extent to which science is drawn upon in the arts of peace and of war alike is evidence that research to-day must be encouraged by every means within our power. The nations are engaged in a research race no less intensive than the armaments races which they now pursue, and with which in the past they have so often amused themselves. It is our insurance that our nation and all for which it stands shall hold its place in peace and in war. Yet the nation, as disclosed by its pay-roll, does not assess research as of any outstanding value. For this reason many of those who were once standing before their Vice-Chancellor to be invested with the insignia of their rank among research workers, now find themselves in diverse by-paths of industry—as insurance agents, as works managers, as salesmen, and so forth—not because they have failed in any way in their true profession, but simply because as a man gets older and his responsibilities increase, he must find means of earning a sufficient income to keep himself and his family in a reasonable standard of living.

The State has done something since the last war to rectify this state of affairs by setting up Research Associations in co-operation with industry; the larger industrial firms have also done a valuable work in this respect, but when all is done, can it be seriously argued that the monetary return to be expected by a research worker is such that the best men will continue after their first youth is past to engage in scientific research as whole-time profession?

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NOTES AND COMMENTS

Plant Accessories and the Future

AMONG the most important and useful functions of the chemical engineer is the provision of devices to facilitate high-class, and at the same time economic, production in the industries which depend on his ingenuity to aid their progress. The industries we have in mind are the various textile processing industries, paper making, glass making, and the like, all of which rely largely on the chemical engineer for recording, measuring, and other similar instruments to use as accessories in the normal process of manufacture. The circumstances of the last twelve months have not been encouraging (to say the least of it) in the development of new plant accessories. Nevertheless, as is recorded in an article farther on in the columns of this issue, a certain amount of really important work has been found possible, and the importance of it has been officially recognised. Moreover, the chemical engineer is sufficiently intelligent to realise that the war is not going to last for ever, and his mind is sufficiently active not to lie idle in the meantime. Reference is made in our leading article to the increasing encouragement that is being given to the research worker; and it is surely not too much to hope that, in the new order of things which victory will bring, this encouragement towards scientific advancement *in the right direction* will be still further stimulated. Let the research workers, therefore, be of good cheer; a weary world once more at peace will look to them for the aids that will help to raise life once again to its normal civilised standards.

New Radiation Pyrometer

A NEW type of pyrometer of considerable interest to those engaged in high temperature work is described in the August issue of the Transactions of the British Ceramic Society by N. E. Dobbins, K. W. Gee and W. J. Rees. Dr. Rees is the well-known head of the Refractories Department at Sheffield University. This pyrometer is designed to give great sensitivity at high temperatures when focussing on small areas. The success with which the objective has been attained may be judged from the fact that whereas the sensitivity of the usual type of optical or radiation pyrometer is 10-20° C. per scale division at 2000° C., the new pyrometer is sensitive to 4° C. per scale division at 2000° C. and to 6° C. at 2400° C.; it can detect a change in temperature of 0.5° C. at 2000° C., whilst 1° C. at the same temperature produces an easily observed deflection of the pointer. A specimen area of 2 cm. diameter is ample when the instrument is set to record at 2 ft. from the surface. The principle upon which the instrument works is the change in current produced by focussing an image of the hot surface on a photoelectric cell. The image of the surface is focussed by an 8 in. focal length objective carried at one end of a draw-tube on to the ground glass screen placed at about 30° from the vertical. The image can be observed from above and must be brought to a focus on the screen. An elliptical hole in the screen permits the central part of the image to pass through on to a collecting lens which focusses it on a photoelectric cell. The light reaching the photoelectric cell under these conditions bears a constant relation to the light emitted by a definite area of the surface of the hot body. A pyrometer of this type has valuable applications in works processes in which accurate temperature control is needed. It can be adjusted to give its maximum sensitivity at any working temperature, and it is reasonable to suppose that under works conditions a variation in temperature of ± 1° C. could be recorded. It would, indeed, be possible to arrange a mirror galvanometer system which would throw a spot of light on to a second cell whenever the temperature deviated from that required by ± 1° C., and this second cell could be set to work a relay and give either visual or audible indication of the deviation.

Utilisation of Pitch and Tar

THE committees appointed some months ago to consider methods for utilising British home supplies of oils for war purposes have naturally devoted considerable attention to tar and the utilisation of tar products for burning. Less tar has been used for roads than is customary and there is still a surplus of pitch for which some method of disposal must be found. There are carbonising plants now available that can utilise pitch for the production of pitch coke, and for the production of the special fuel now required for the traction gas producer. Tar producers, however, have not seen fit to introduce either of these methods of tar disposal into their works routine and the minds of those concerned with pitch disposal appear to run primarily in the direction of utilisation for combustion. In order that this shall be done the pitch must be melted and is generally heated to some 250-300° C. before being fed by gravity through a pipe-line to the burners. Tars often require to be reheated also, though not to the same degree. It is interesting to notice that according to the National Gas Bulletin of Australia, the South Australian Gas Company has contracted to supply 40 per cent. of its make of tar, or 3000 tons a year, to a neighbouring glass works for furnace heating. The tar thus supplied is a mixture of horizontal and vertical tars which after mixing must be filtered and heated to 77° C. At this temperature the tar is put into the delivery tank and taken directly to the glass works in insulated tank waggons. In this way the pitch running from the stills could also be used if there was a works sufficiently near which could accept a reasonable daily tonnage. The heat required for melting the pitch could be saved and the more difficult part of the pitch utilisation process could be obviated. There seems something in this idea which might be extensively applied in this country.

TEXTILE PROCESSING MACHINERY

Some Recent Improvements under Difficulties

by G. S. RANSHAW

As in other branches of industry, home trade machinery activities during the past twelve months, as far as textile dyeing and finishing are concerned, have been severely restricted to repairs and replacements; but new machines, for which Government licenses have been obtained, can be delivered under the Machinery and Plant (Control) Order, 1940. Any attempt to assess recent progress in this field must take account of this, and also of another most important set of conditions peculiar to the textile trade.

In the first place the trade, relatively speaking, is small, and the number of new machines required to come into production annually is small also; furthermore the low-priced nature of the bulk of the finishing trade, wool or cotton, precludes the introduction of the best and most highly finished apparatus. Consequently, compared with equipment supplied to allied trades of paper-making and printing, that of the textile finisher may appear, in certain instances, somewhat crude and ill-designed, nevertheless, the development of the higher-class textiles during recent years has necessitated and called forth superior equipment involving better design and workmanship, and incorporating much automatic operation.

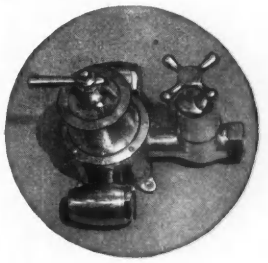
The two fields in which increasing ingenuity has been applied recently are those concerned with the actual dyeing of fabrics, and with the machines needed to dry, stretch or finish woven fabrics; the latter are amongst the best examples of engineering design applied to textile machinery. As to the materials used in the construction of all these machines it must suffice here to say that, thanks largely to the enterprise of supplying firms, stainless steel and other non-corrosive metals and products have almost totally displaced the older wood, whilst there has been a marked tendency to combine smooth, polished surfaces with freedom from nooks and crannies which harbour dirt and unused dyeing material.

Tendencies in Modern Design

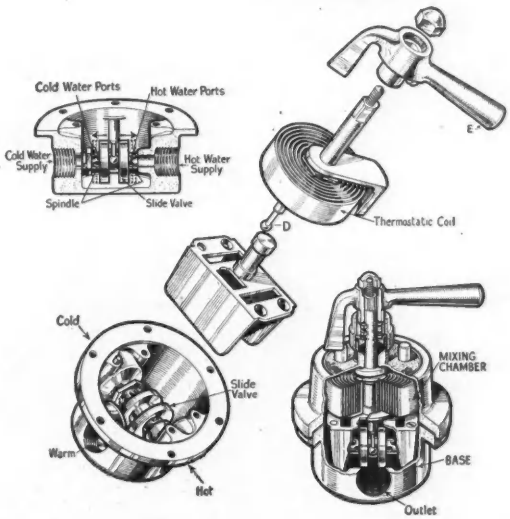
Machines for dyeing piece-goods operate either "in the open width" of the fabric, or with the cloth in the form of a "rope." The former are termed "jig" machines, the latter "winches," and progress has all tended to make these suitable for processing delicate, high-class fabrics with expensive dyestuffs. On the one hand the designer has striven after the avoidance of tension on jig machines, together with freedom from creasing, whilst a notable tendency in the design of winches is the total enclosure of the machine, the object being to save heat loss or, in advanced types, to enable the cloth to be worked in a non-oxidising atmosphere (by introduction of an inert gas). Subsidiary features in modern jigs concern the drive, which is increasingly by individual motors: the modern small, totally enclosed externally cooled motor with oil-immersed starter being reliable and productive of certain economies in installation. Some jigs, indeed, utilise a small D.C. motor to drive *each roller*. Here the two motor armatures are connected in series to the supply mains and electrical control both of the speed and tension of the cloth. Most modern jig dyeing machines are also fitted with stainless steel or vulcanite scroll rollers, or light curved-bar rubber-sleeved expanders to obviate danger of creasing when the cloth is run on to the batch rollers. Finally, as regards winch machines, these are made now in varying widths, taking up to 15 pieces at a time, an advantage when planning the lay-out of a new dyehouse.

Turning to the "stenter," or machine which dries, stretches and folds the cloth to a uniform width and in such a way that the warp and weft threads run reasonably straight and parallel, the chief developments have been concerned with the evolution of the *travelling* stenter. Originally, in its cruder forms, the stenter consisted of two long, parallel beams furnished along their length with hooks or "pins" on which the cloth was placed by hand, and the beams moved until the right width was attained, in which position the cloth was allowed to dry.

The first move, of course, was to speed up the drying process, after which it was logical to attempt to guide the cloth at the required width and at a suitable speed between moving pin chains, with consequent increase of output. Machines consisted essentially of a pair of substantial cast iron rails for the chains on sturdy cross-beams, and adjustable for width. The chain rails were machined out to take the clip chains, which were driven at the outgoing end by means of sprocket wheels. To drive the chains, a stout cross-shaft with bevel gears actuated the shafts of the sprockets.



Thermostatic bi-metal hot water mixing valve, by Walker, Crossweller & Co. Ltd., shown complete and dissected.



Modern engineering practice, however, has been utilised to effect improvements. The most radical departure is that whereby two separate electric motors are used for the drive. Each is mounted on one of the chain rails and drives its own chain. The motors are coupled electrically so that their relative speeds cannot vary although they can be accelerated or retarded together. The vertical shafts are simply driven by a worm drive from the motors.

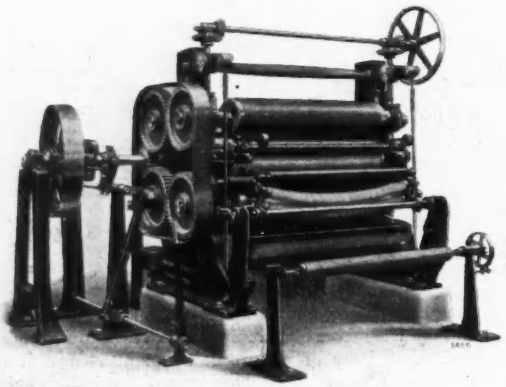
Pin chains, as has been mentioned, were early replaced on the travelling stenter by the spring clip, or the automatic, self-feeding clip. In some recent machines, however, particularly those for rayon and silk, the pin stenter has again emerged because it affords the ability to control the final dimensions of the piece by permitting natural shrinkage, especially in the warp direction. These stenters, however, utilise the device of "over-feeding," enabling the cloth to be put slackly on the pins so that it can shrink warp-ways during drying.

The drying problem has also been exhaustively investigated. In almost all cases moisture removal is effected by the application of a stream of hot air. Here it is recognised

that velocity of application is the deciding factor, and consequently streams of suitably heated air are caused to impinge on or along both sides of the cloth surface at a velocity which could not be attained with the old method of blowing through the cloth. Balance on both sides of the cloth is an especial requirement to-day, when complete absence of strain is necessary in dealing with delicate fabrics.

A question which has not yet been elucidated is the effect of temperature on the finish of the fabric. It is generally held that 160° F. to 180° F. is the upper limit for drying rayons, and it is contended, therefore, that the temperature of the drying air should be kept below this. On the other hand, at considerably higher temperatures of drying air the cloth itself will be found to stay remarkably low until drying has proceeded quite a long way, and machines can therefore be designed for a higher output than was long regarded as safe.

Cloth guiding and control in the stenter frame, with their associated problems, have provided the greatest outlet for the ingenuity of the designer and the most interesting applications of science to textile finishing are to be found here, although mention can only be brief. The main problem involved was to *feed* cloth to the pins *automatically*. Modern pin stenters operate by causing the pin chains to follow the position of the selvedge by moving their entering rails, *i.e.*, by guiding the rails. A reversible electric motor is employed on each rail, driving a screw through reduction gearing, the nut on the screw giving motion to the rail. The cloth selvedge feeler operates between two electric contacts which in turn close the coil circuit of one or other of a pair of reversing contactor switches controlling the motor. More accurate guiding, however, is effected by the use of guiders

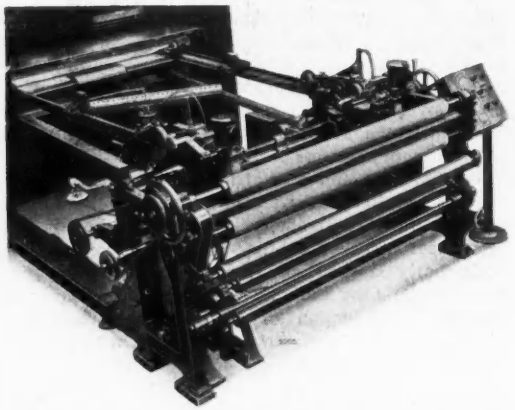


Three-bowl padding mangle for vats, made by Mather & Platt, Ltd.

of a reciprocating type, the rail being moved by a piston actuated hydraulically or by compressed air. The all-pneumatic type is due to Mather and Platt, Ltd., and a combined pneumatic and hydraulic type is made by John Dalglish and Sons.

Finally, consideration has been given to accurate means of *testing* the dryness of a cloth, and dryness testers giving automatic indication and in some cases control of the final moisture content have been introduced. Some utilise the capacity of the cloth for maintaining a static electrical charge, others the functioning of the cloth as the dielectric of a condenser.

Restrictions of space do not permit of any detailed investigation of other fields in which improvements in the apparatus and plant used for textile processing have taken place recently. In general, the vast improvement in jigs, winches and stenters—the principal tools of the dyer and finisher—is a sign that the industry is alive to the necessity for keeping abreast of engineering progress. Nevertheless there has been an accompanying increase in the willingness of the trade to investigate the advantages of other appliances which have a bearing on the operations it has to conduct, and especially as regards the whole subject of automatic process control things are in a state of flux. For so conservative an industry as that of textile manufacture to have even consented to concede that there " may be something in " auto-



Entering end of pin stenter, showing over-feeding and automatic guiding arrangements (by Mather & Platt, Ltd.)

matic pH control in dyeing processes, for instance, indicates that the old aloofness from the scientific method of approach is being discarded, and the author of an article such as this in five years' time may have a very interesting tale to tell.

Acrylonitrile Production

Increasing Demand in U.S.A.

PRODUCTION of acrylonitrile, an intermediate in the manufacture of some of the newer so-called synthetic rubbers, is being doubled to meet increasing demand for this product, according to a statement by Mr. B. W. Henderson, manager of the Rubber and Rubber Chemicals Division, American Cyanamid and Chemical Co., reported in the New York *Rubber Age*. Acrylonitrile, derived from cyanamide, and butadiene, made from petroleum, are combined to produce synthetic rubber.

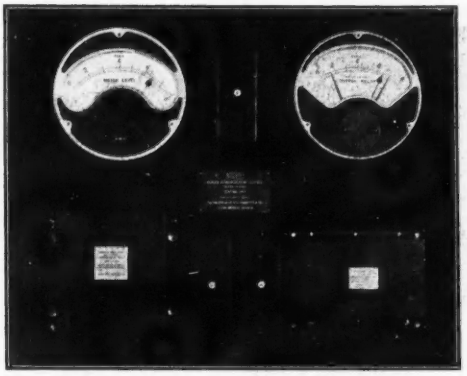
Commercial producton of acrylonitrile was undertaken by American Cyanamid several months ago to supply a rising demand. This demand has already required a doubling of production capacity and further substantial increases are expected as its use for synthetic rubber and other purposes grows.

Acrylonitrile is a colourless liquid with a mild odour, boiling at 77° C. It is highly reactive chemically and its present availability in large quantities is expected to lead to new uses in chemical synthesis, as well as in the field of synthetic resins and plastics. The material, according to Mr. Henderson, possesses a high purity and since it is quite non-corrosive it can be safely handled and shipped.

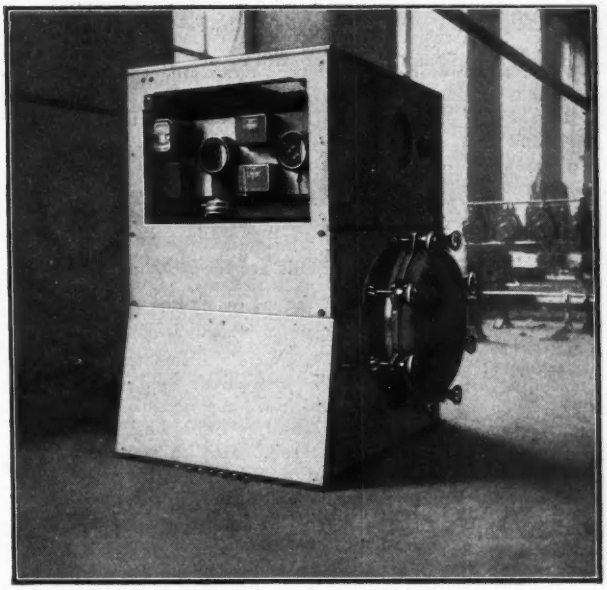
ALLEGED MURDER IN WORKS

At Rutherglen Police Court, on September 12, the charge was made against John Ewing, chemical worker, Bridgeton, Glasgow, that on September 8, in the dining hall of Shawfield Chemical Works, Rutherglen, belonging to Messrs. John and James White, Ltd., he represented to William Shields, an employee of the firm, that a bottle which he had in his possession contained a non-poisonous substance and that Shields, having consumed, with accused's consent, a quantity of the contents, became ill and died, and that he did thus murder Shields. Accused was further charged with the attempted murder of John Nicoll, also an employee of the firm, by representing that the bottle contained wine, whereby Nicoll became ill, and thus did attempt to murder him. Accused was remitted to the Sheriff Court at Glasgow.

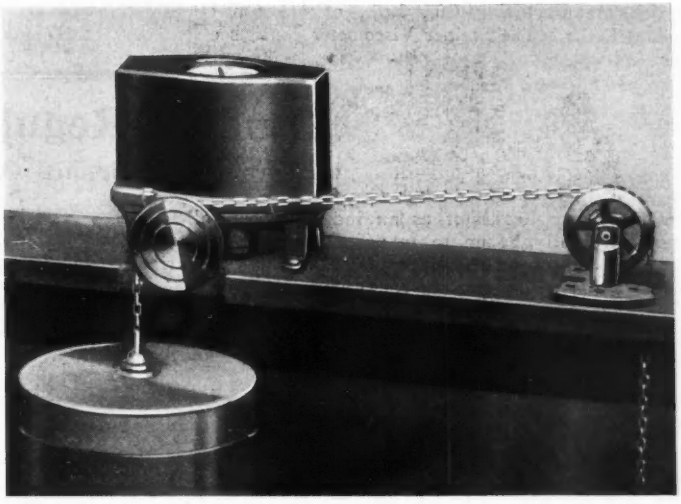
NEW TEXTILE PROCESSING ACCESSORIES

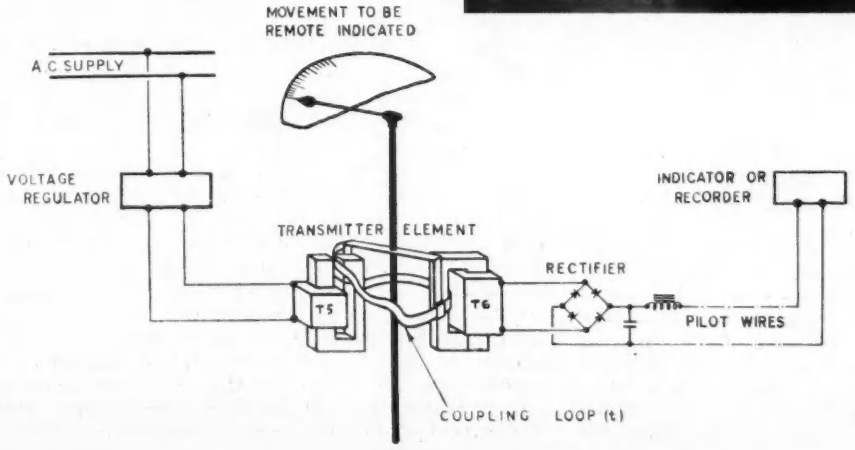


Automatic Control Unit for Water Level Equipment (above); Recorder for Water Level (below), both by Elliott Bros. (London), Ltd.



MTB Automatic Steriliser, by Muschamp Taylor, Ltd.





Water or Liquid Level Transmitter (above), with float and counterweight, by Elliott Bros. (London), Ltd.; Diagram (left) of arrangement of Transmitting Element, Elliott Transmission System (Shotter Patents).

Steiner Viscometers

Wide Range of Application

LIQUIDS of the same sort may have widely differing degrees of viscosity, a quality that is more and more utilised for analysis and for the control of manufacture. Two liquids which have otherwise very similar analytical qualities often have viscosities so different that there can be little doubt about their difference or identity. During manufacturing processes viscosity may change so markedly that it is in some cases the most precise and convenient means of control. In one way or another viscosity is significant in dealing with mineral oils, varnishes, tar, chocolate, blood, solutions of rubber, glue, cotton, and many other materials.

Almost as numerous as the liquids are the instruments for measuring viscosity. Some are very primitive, consisting of a container with a hole in the bottom, others are very intricate, consisting of motor driven cylinders with speed regulation, thermostatic bath and control, automatic timing and recording. According to the instrument used viscosity is expressed either in readings which are consistent only with that particular instrument or in absolute units which are of standard value to anybody concerned. Modern research is, needless to say, in favour of absolute units.

Because of the great variety of materials it is not possible to apply a single measuring device to all the problems that may occur. It has, however, been possible to develop an instrument, the Steiner Viscometer, which suits a great number of materials, and problems, having a large viscosity and temperature range, and needing only 6 ml. of liquid to make a complete viscosity test, *i.e.*, the variation of viscosity with temperature. This instrument is manufactured by the C. L. Burdick Manufacturing Co., Ltd., of 6/8 Amwell Street, London, E.C.1. The Steiner Viscometer consists essentially of a measuring tube, to be filled with the liquid under test, and of a jacket filled with glycerine which serves as a bath to maintain temperature. The small quantity needed is of special advantage to laboratories which have to test samples sent in by customers or agents, or to researchers.

The same general arrangement is used in connection with the following measuring principles: a rising air bubble, a falling body or a rolling sphere. Each of these types has its special application and in general no Steiner Viscometer is supplied to be used with more than one of the above principles. Which principle is applied depends on the material to be tested, the viscosity and temperature range. A rolling sphere instrument can be supplied to cover a temperature range from -35° C. to 160° C. and a viscosity range from 0.1 to 1,000,000 centipoises.

In many viscometers the personal error of the operator is a source of great uncertainty. With the Steiner Viscometer results are precise and can be reproduced within very close limits, the operation being very simple. The precision varies according to type between ± 3 per cent. for the portable types to ± 0.1 per cent. for a research type. Results are expressed in absolute units, tables supplied with each instrument enables the readings to be converted to Redwood seconds, Saybolt seconds or Engler degrees.

Steiner Viscometers are supplied in two different sizes. The small one, heated by a gas flame or other source of heat, is especially useful for rapid plotting of viscosity curves. The large type has built-in electric heaters and the temperature can be regulated at any desired point by hand. Both sizes can be connected to a Steiner Constant Temperature Equipment, which ensures an exceptional degree of accuracy.

Energy Regulator

Industrial Furnace Control

THE Energy Regulator as an industrial controller has only recently begun to take its proper place among industrial equipment. The regulator replaces a variable resistance and will control up to 30 amps. A.C. or D.C. It will keep the energy input constant, independent of mains voltage fluctuations, at any setting between no load and full load without the energy dissipation inevitable with resistance control. It is particularly valuable for the control of industrial furnaces and hot-plates.

The illustrations show diagrammatically the operation of the Sunvic Energy Regulator. The instrument is arranged for front of panel mounting and it is used in conjunction with a Sunvic vacuum switch.

The regulator operates no time cycle, the timing being obtained by means of a bi-metal element carrying a heat winding connected in series with a snap action switch actuated by the bi-metal blade. The distance between the snap action switch and the bi-metal is adjusted by means of the control knob. When the control knob is in the zero position the bi-metal blade presses hard against the switch and the circuit is maintained permanently open. In the full-on position the switch is so far from the bi-metal that it is unable to open it, and the circuit is thus permanently made. Between these two limits the on/total time of the switch, and thus the average power in the circuit, is proportional to the knob position.

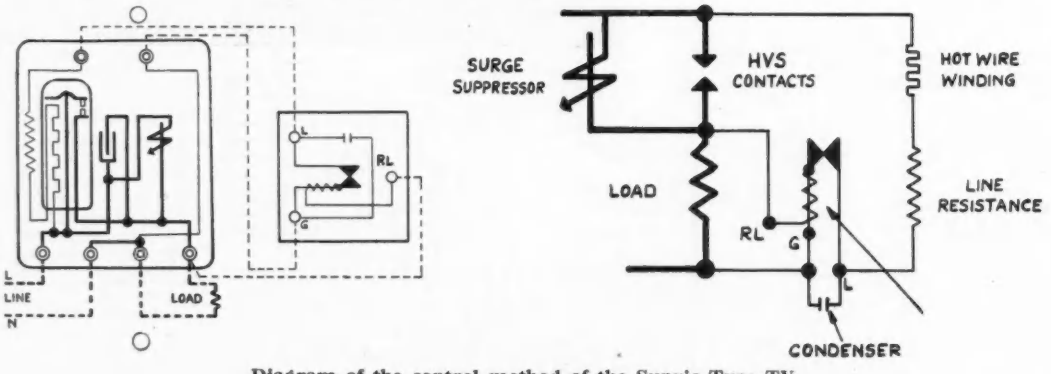


Diagram of the control method of the Sunvic Type TY Energy Regulator.

INDICATORS AND RECORDERS

Their Purpose and Service

by C. H. BUTCHER

FOR all chemical reactions there are conditions which determine the true course and the ultimate result. Temperature, pressure, and rate of flow of the reactants, and the degree of acidity or alkalinity (as *p*H value), are mainly concerned, but may be presented in different forms as a matter of expression. Moreover, they can be varied within wide limits as regards what is arranged prior to the commencement of the reaction, and during the course of the reaction they can also vary in accordance with the changes that are taking place. There can be either ill or good consequences, according to what conditions are most favourable for the reaction to proceed as desired.

Where economic methods of manufacture are a matter of concern to industry, considered apart from safety in the operation of plant, these conditions have to be kept at their most favourable level. To do this they have first to be measured, so that the course of events can be predicted and the correct adjustments made. Expressed otherwise, the plant has to be provided with measuring instruments for those so-called variables which it is necessary to measure. No plant, in modern aspects of efficiency or safety, can avoid the use of one or more of these accessories, according to the nature and extent of the factors involved. Even a simple open-top steam-jacketed pan needs a pressure gauge to show the pressure of the steam in the jacket. Just what variables are in need of measurement will vary with the plant and the nature of the process for which the plant is used. Sometimes there is need to know but one; at other times there may be many variables, or combined influences, which are best known for their effect on efficiency of working or from safety aspects alone.

Measuring instruments, therefore, have a definite purpose to fulfil, but their use may vary according to circumstances. When they merely measure some variable such as temperature or pressure and give indication of it, they are to be spoken of as "indicators." When they make a permanent record of the measurement upon a chart, they are "recorders." Generally, in the latter case both purposes are served and they are correctly termed "recording indicators." Each class has its needs, and the adoption of one or other depends upon the conditions attending the operation of the plant. For example, it may merely be necessary to know how and to what extent some variable is changing from minute to minute, so that valves can be controlled to rectify the variation or at least keep it within certain desirable limits. On the other hand, it may be very useful to have a permanent record of the variations taking place from minute to minute, with or without simultaneous indication.

The Value of Charts

The charts from recording indicators are valued from more than one aspect. They show the course of changes that have taken place in the operation of the plant over a period of time, and a careful study of them reveals inefficiencies of plant operation if such exist. Considered in this light these charts will show where conditions of operation can be improved, or where there is waste, as in the case of steam consumption. By computing quantities, where this is possible, the resulting information serves usefully in the estimation of working costs. Conditions approaching danger-point are also indicated, and where accident or breakdown has actually taken place a study of the appropriate charts, if not all charts which are available, will often indicate the primary cause or at least show where and at what time conditions were unobserved or getting out of hand.

Although the indication and recording of plant variables has become so desirable, if not absolutely necessary, it is surprising that much plant continues in operation with just the bare minimum of accessories of this type. Precisely what is needed is sometimes a little difficult to decide, apart from the obvious; on the other hand, there is sometimes a tendency to be quite unbalanced in the matter of providing too many instruments, or so choosing them that there is undue complexity of indications and recordings from which the essential or most necessary facts are difficult to ascertain without hindrance. Plant can easily be over-equipped or under-equipped with instruments whose initial cost and upkeep must be considered in the light of the information and service they will give. A reputable instrument maker will give good advice in this direction, based on experience of users of his instruments and a knowledge of what it is generally desired to know for the goodwill of the plant and process; still, an over-enthusiastic salesman can just as easily adorn the plant with dials which are neither essential nor useful, or otherwise suggest refinements in instruments which are out of proportion to the degree of accuracy really needed.

Maintenance of Instruments

In this matter of providing instruments for the plant, it is not always an easy matter to see at a glance what is required, much less the maker's model which will give the right degree of service without undue expense. Initial expense is not final; all instruments have to be kept in good working order, and must be capable of standing sudden fluctuations to which conditions in the plant may be subject. Maintenance by the maker, under a service contract, is the most satisfactory, unless the works be a large one where many instruments are installed and it is possible to employ a full-time instrument man. Good maintenance, with the right model for the job, is the keynote of successful indicating and recording. In some cases a cheap instrument may fulfil a purpose, but in other cases it may be false economy, owing to its unreliability and consequent additional expense for maintenance. However, this does not mean that the most expensive instrument must be chosen, because the degree of accuracy and protection against shock may extend far beyond the real needs of the plant. Refinements in construction are many and varied for instruments of the recording type, where charts may be of different forms and one or more variables may be recorded, perhaps with a record of their combined effect upon the plant. The operation of some controlling device may also be provided for.

Indicating and recording instruments must be selected in a commonsense manner, with a clear idea of what degree of accuracy is desired, the range over which the variable is to be measured, and the relative extent to which sudden fluctuations may occur. There are cases where both measurement and control are most desirably combined, as for temperature and the resulting pressure in an autoclave. All variables do not require separate control, even though they be measured and indicated. Likewise in the case of installing an indicating recorder rather than merely an indicator, every variable that is indicated need not be permanently recorded, but it should be borne in mind that chart records will often prove their usefulness long after the primary need may have been satisfied. For this reason they should be studied critically, and not merely examined. The nature of the plant and process will determine how far they need be studied and compared and at what intervals.

Instruments are now available in a remarkably wide range of patterns. There are really few if any that may be regarded as inferior. In the first place, instrument design does not lend itself to inferior manufacture, as such; secondly, the reputation of the maker is at stake. If an instrument is to be capable of working at all it must reach a certain level of

perfection; how far it exceeds that will be due to the experience and pride of the maker, who wishes to provide an instrument that will continue to give good service over a long period of time. This does not imply that cheap instruments are not among the aims of some makers; they are produced at lower cost because there is need for them, and the lower cost is achieved by cutting out certain refinements and not by shoddy manufacture. Initial cost can be a notable item, and the amount allowable will depend upon the plant that has to be equipped.

Accuracy is the first need for all instruments, but there must also be quick response to changes. This quick response becomes especially important where the instrument is actuating some controlling device, and fluctuations for one minute or less can easily have ill effects, either from the point of view of safety or the quality of the ultimate product. Variations at one part of the plant will make a large batch of material "off standard." Controlling devices should be of the simplest pattern, as far as permitted by the task which is to be accomplished; they are then easier to adjust if the need arises. This is especially the case for controlling the rate of flow in some definite ratio and for maintaining level of liquid in continuous distillation processes. Position of installation on the plant is mainly determined by its accessibility, for instruments are now distance-operated from the point where the measurement is made. By being placed together at a point which is accessible and convenient for the man in charge of the plant, they allow supervision of plant operation to the greatest degree, the changing of charts is made easy, and maintenance and adjustment are not hindered. This centralising of instrument dials is a general practice, it is agreed, but there are works where it could be carried out better for the man in charge of the plant, and for the benefit of each plant unit in the case of large manufacturing processes.

For steam power production and utilisation, the selection and installation of the instruments has reached the ideal. Arrangements at power plants attached to the larger chemical works could be studied profitably by users of instruments in a lesser degree. The provision of instruments is often shortsighted in that much attention devoted to measurement at certain points will be combined with complete disregard for other points, especially in the utilisation of steam and also water for cooling purposes. Steam production and water pumping in excess of what is really needed can increase process costs to an unsuspected degree. So also, there are ill effects from defective plant and dirty plant, which are often reflected in the chart records.

Accuracy and sensitivity in response, with different patterns to meet different needs, has not been the only aim of the makers. For indicating recorders there has been a great advance in presenting data of different kinds upon the same chart, in order to facilitate comparison and give a better view of the combined effect of variables. For instance, in the case of steam power production it is very desirable to compare flow of steam with such related factors as pressure, temperature, level of water and ingress of air, especially for dry saturated steam. Continuous distillation plant for petrol and similar volatile products will provide cases where the utility of chart recordings is often surprising.

Process control can be achieved to its highest degree only by the use of instruments operating from the correct points on the plant, so that each unit operation becomes co-ordinated and flow is adjusted throughout. Few variable conditions, if any, are difficult to measure with the experience that the instrument makers have gained; controlling mechanism can be applied for most needs, irrespective of whether it is in the nature of a valve to correct the addition of a particular solution or a device to arrest a slight change of colour. Even the simple measurement of temperatures and pressures can be carried out with much refinement as to their ultimate purpose. Electrical recording instruments working on potentiometric principles do much more than is often expected of them. Draught indicators placed at certain points in ducts which carry gaseous products, or hot air for drying processes, will show just what is happening and how far conditions can be improved. Both ends of the plant have to be considered; in the case of steam production there is the boiler feed water as well as the distribution of the steam, and there is temperature and pressure and dryness of steam (to be unduly expressive) as well as amount produced. Data are obtainable in all chemical plant operations irrespective of their nature, but these data can become available only by use of indicating and recording instruments.

Export Credit Guarantees

Protection Against Loss

UNDER the provisions of the Export Guarantees Act, 1939, the Export Credits Guarantee Department is authorised to give guarantees in connection with the export to any country of goods not being munitions of war. The guarantees may be given to, or for the benefit of, any person, firm or company carrying on business in the United Kingdom, and the goods, generally speaking, must be home produced or manufactured.

The guarantees protect exporters against the main risk of giving credit to overseas buyers. Losses arising from the insolvency of the buyer can be covered by the Department's Comprehensive Guarantee Policy for the whole of an exporter's business during a forward period of twelve months. An Addendum to the Comprehensive Guarantee, which can be obtained for a supplementary premium, protects the exporter against the risk that a buyer may be unable to make payment when due owing to the imposition of exchange restriction, or to the occurrence of war between the importer's country and the United Kingdom, or to war, hostilities, civil war, rebellion, revolution, insurrection, civil commotion or other disturbance in the country of the buyer.

Firms in the engineering and allied industries are often asked to give medium-term credits of from one to five years to purchasers of plant, machinery, etc., whether they be governments, municipalities or private traders. In the case of private buyers the risk covered by the Department is the loss which may be sustained from the insolvency of the buyer. In the case of governments, municipalities and other public bodies the Department's guarantee covers exporters against the risk of default. The question of raising funds for financing this kind of contract is frequently a matter of difficulty. Experience has shown that in such cases negotiations are greatly facilitated by the Department's guarantees.

Policies are also issued to cover 75 per cent. of loss incurred owing to shipment of goods ordered being prevented by various causes. These are: (a) the insolvency of the buyer before shipment is due to take place; (b) the imposition of import restrictions in a buyer's country after an order has been placed which, in their effect, render it impossible or impracticable for the buyer to take delivery of the goods; (c) the occurrence of war, hostilities, civil commotion and the like in the buyer's country. The strictest secrecy is observed in all correspondence and transactions.

Exporters are invited to apply for further particulars to the Headquarters of the Export Credits Guarantees Department at 9 Clement's Lane, Lombard Street, London, E.C.4, or to any of the branch offices: Manchester—56 Spring Gardens; Bradford—69 Market Street; Birmingham—37 Temple Street; Sheffield—Fargate House, Fargate; Newcastle-upon-Tyne—21 Mosley Street; Glasgow—7 West George Street; Belfast—7 Donegall Square West; elsewhere to the Secretary of the Chamber of Commerce.

INDUSTRIAL AND ENGINEERING CHEMISTRY

Papers Presented to the American Chemical Society

THIS week we give further abstracts of papers presented at the meeting of the American Chemical Society, held at Detroit, Michigan, from September 9 to 13, these dealing with industrial and engineering chemistry. Their publication is made possible by the courtesy of the Society.

In a paper on " The oxidation of aromatic hydrocarbons," C. R. Downs pointed out that toluene, naphthalene, and anthracene were for many years oxidised by chemical methods in the liquid phase respectively to benzoic acid, phthalic anhydride, and anthraquinone. Later it was found that they could be oxidised to these same products more cheaply by air at elevated temperatures in the vapour phase in contact with various solid catalysts. All three products, however, are now made from one raw material, namely, naphthalene, rather than from what offhand would appear to be their most logical sources. This result has been dictated by economic reasons which the chemical engineer must always recognise as being of more importance than the chemical reactions themselves.

All benzoic acid and anthraquinone and its derivatives now made in the U.S. are produced from phthalic anhydride, which in turn is made by the vapour-phase catalytic oxidation of naphthalene. In addition to these uses, phthalic anhydride is of great importance in its own right, especially in the synthesis of synthetic resins. It is estimated that the present production capacity of phthalic anhydride equipment in the U.S. is about 75,000,000 pounds per year. There is no potential shortage of domestic naphthalene for producing phthalic anhydride in much larger quantities than is indicated for future consumption. If the catalytic oxidation of naphthalene to phthalic anhydride were not known, phthalic anhydride could not occupy its present outstanding importance as an intermediate. By the old process using sulphuric acid to oxidise naphthalene, the present installed capacity would require an estimated annual consumption of 750,000 tons of 100 per cent. sulphuric acid. The cost of contact sulphuric acid plant for this purpose is estimated at close to $8,000,000 and the acid cost alone would probably amount to 25 per cent. of the present sales price of phthalic anhydride.

Research on Quicklime

Conditions affecting the settling rate of calcium carbonate in the causticising process of soda ash were described by John C. Olsen and Otto G. Direnga, Polytechnic Institute of Brooklyn. The following factors were studied: temperature, agitation, particle size of lime, amount of water used in slaking, presence of soda ash in the water used for slaking, previous exposure of the lime to air, reaction rate of the lime, relation between particle size of slaked lime, and the calcium carbonate produced.

An experimental study was made of the equilibrium in the reaction $CaO + H_2O \rightarrow Ca(OH)_2$. The results show that the values given in Lunge's table of causticity are inaccurate and that the values obtained by Goodwin are correct. It was shown that settling tests must be conducted at a constant temperature and that failure to do so will give meaningless results. A new factor, the effect of exposure to the air of the quicklime before slaking on the particle size and on the settling rate of the hydrate and carbonate, was studied; and it was found that the settling rate of the hydrate as well as the carbonate was influenced to a very great extent. This factor has not been studied by other investigators and was found to be of great importance in all methods of slaking. It had been found that the size of hydrate particles or carbonate particles increases, as the size of the quicklime particles decreases. This effect was more or less pronounced, depending on the particular method of slaking employed.

The effect of using excess water in the slaking process was also studied. The claim of other investigators, that the use of the theoretical amount of water produces the fastest settling hydrate or carbonate, and that successive increases in the amount of water used caused successively finer hydrate or carbonate particles, was found to be in need of modification. Experimental data presented by the authors show that the use of the theoretical amount of water does not produce the fastest settling hydrate or carbonate. Rather, it was found that the fastest settling hydrate or carbonate is obtained by using an excess over the theoretical amount which, according to the experiments of the authors, was twice the theoretical amount. The results obtained by other investigators, that the relative particle size of the hydrate persists throughout the causticising stage, was found to be correct. The authors found that the rate of reaction decreases with time of exposure of the quicklime before slaking, with an increase in the particle size of the quicklime, and with an increase in the concentration of sodium carbonate in the slaking water. The most outstanding result of the investigation was to show the effect of preliminary exposure of the lime to air and the remarkable agglomeration of small particles to larger size particles, giving rapid settling.

Use of Chloroparaffins

A paper on " Utilisation of polychloropropanes and hexachloroethane " was contributed by E. T. McBee, H. B. Hass, T. H. Choa, L. E. Thomas and Z. D. Welch, Purdue University and Purdue Research Foundation, Lafayette, Ind. The authors made stability tests on the isomeric dichloropropanes in order to determine the potentialities of those materials as solvents. Tests in which iron, sodium bicarbonate, and cupric oxide were used with the chloroparaffins indicated that of the isomeric dichloropropanes, only 2,2-dichloropropane was substantially decomposed under the conditions employed. The stabilities of 1,1- and 1,2-dichloropropane are approximately the same as that of carbon tetrachloride. The authors contend that if the reaction temperature does not exceed 200° C., it is possible, by prolonged chlorination, to prepare octachloropropane from the isomeric dichloropropanes. Higher temperatures result in an increased formation of carbon tetrachloride and hexachloroethane by fission of the carbon chain. This reaction was performed in the liquid phase both at atmospheric pressure and under superatmospheric pressure in sealed tubes. Although the reaction becomes very sluggish during the latter stages, octachloropropane can be prepared in excellent yields. A suitable reaction catalyst was not found.

Saturated chlorocarbons containing two or more carbon atoms undergo disintegration upon thermal treatment with the formation of carbon tetrachloride and tetrachloroethylene. Octachloropropane was converted into these products by pyrolysis in the vapour state at 400° C., and the same conversion was effected in the liquid phase at 100° C. by using anhydrous aluminium chloride as a catalyst. Yields of the desired products as high as 92 per cent. were obtained. A purely thermal pyrolysis of hexachloroethane at temperatures of 550° to 600° C. gave substantially quantitative conversions to carbon tetrachloride, chlorine, and tetrachloroethylene. The conversions were progressively lower as the temperature was lowered. The loss of one molecule of hydrogen chloride during the pyrolysis of 1,2-dichloropropane at temperatures ranging from 540° to 750° C. resulted in the formation of 3-chloropropene, *cis* and *trans* 1-chloropropene, and very small quantities of 2-chloropropene. The ratio of isomeric chloropropenes was found to be nearly independent of the temperature employed, and 3-chloropropene always constituted approximately 60 per cent. of the chloro-olefines.

After the discovery that the exhaustive chlorination of

chloropropanes at elevated temperatures results in the formation of carbon tetrachloride and hexachloroethane, this reaction was carried out in high-pressure equipment. It was found possible to mix chlorine and dichloropropanes in the theoretical amount required for complete substitution of the remaining hydrogen atoms and to pass this mixture at a pressure of approximately 1000 lb. per sq. inch through a reaction tube maintained at 300° to 400° C. Such a procedure gives substantial amounts of carbon tetrachloride, tetrachloroethylene, and hexachloroethane.

Phenol Sulphonation

"Synthesis of phenol using a partial pressure evaporation method" was the title of a paper presented by Donald F. Othmer and Charles E. Leyes, Polytechnic Institute of Brooklyn. They pointed out that the process disclosed by Dr. Kokatnur in U.S. Patent 2,111,973 is based on novel combinations of well-known principles of physical chemistry and chemical engineering, and theoretically should have considerable economic advantages over commercial sulphonation methods. The process as described can be applied to either the sulphonation or halogenation methods, and basically involves the formation of an intermediate sulphonated or halogenated compound in the presence of an inert diluent (such as gasoline), followed by neutralisation and hydroxylation with caustic soda under kerosene. This same principle can be applied to the production of hydroxy derivatives of benzene and naphthalene as well.

The procedure recommended in the patent is as follows:—100 parts of benzene are dissolved in 100 parts of a saturated hydrocarbon, such as gasoline, and 100 parts of 99 per cent. sulphuric acid added, and the mixture heated until all of the water of reaction has been removed. The reaction mass is allowed to cool in the still; and a kerosene fraction, preferably boiling between 320° and 360° C., is added. The calculated amount of sodium carbonate is gradually added, with agitation to neutralise the sulphonic acid and free sulphuric acid. Caustic soda is now introduced (from 5 to 50 per cent. excess over theory) and the mass again heated until all the water has been removed. The kerosene is recovered from the reaction mass by filtration, followed by washing with a solvent and the phenol and sodium sulphite recovered in the conventional manner.

Considering first the sulphonation, by the use of an inert diluent such as gasoline, the boiling point of benzene can be elevated considerably; hence the initial rate of reaction may be expected to be much more rapid than with ordinary methods Furthermore, at these elevated temperatures the vapour pressure of water over sulphuric acid becomes appreciable, and the use of an inert hydrocarbon material permits this water, as well as that formed in the sulphonation, to be removed azeotropically. This allows the use of molecular proportions of relatively dilute acids, instead of large excesses of concentrated acid, and should allow the reaction to go to completion. In the fusion step, the temperature can be reduced considerably by the use of hydrocarbon diluents, and further advantage is taken of azeotropic distillation for the removal of the water formed in the neutralisation and fusion, as well as any water that may be present from the caustic. The use of hydrocarbon also gives a more even heat control medium, and should prevent superheating. The fusion mass is a sintered product, not a fused lump, and is readily soluble in water, unlike ordinary fused materials. Another favourable aspect of the use of the hydrocarbon agent is that the fusion is accomplished with the complete exclusion of air, thus avoiding the decomposition of any of the product due to oxidation by air.

The fundamental advantage in the Kokatnur process is its low material costs. Sulphonations were carried out using the theoretical molecular ratios of benzene and sulphuric acid, whereas with existing processes large excesses of either reagent are necessary. The fusion of sodium benzene sulphonate, to produce phenol, was performed under kerosene with aqueous caustic solutions. Normally, fused caustic is required for this operation. Both of these innovations represent considerable reductions in the cost of raw materials, in the case of the fusion amounting to an estimated 0.917 cent per pound of phenol produced, or approximately 7.6 per cent. saving, based on a market price of 12 cents per pound for phenol.

No investigation as to the actual cost of operations or investment could be made on the basis of the present data, other than in a comparative sense, but these indications show that these costs should be in essential agreement with present processes and possibly slightly more advantageous. The major research was devoted to a study of the sulphonation step. Here it was shown that both reaction temperature and degree of agitation are important factors. Optimum results were obtained with high-speed (1000 r.p.m.) emulsifying agitators and naphtha cuts boiling in the range of 170° to 200° C. Either 94 or 98 per cent. sulphuric acid may be used. No sulphones are formed under proper conditions. Charring and evolution of gas do occur, but these problems can be overcome. Two major developments have been proved in this research on the Kokatnur process. The first was that high yields of benzene sulphonic acid can be produced with no sulphone formation using the theoretical molecular proportions of benzene and sulphuric acid by the removal of water of reaction by a naphtha fraction. The second was that 50 per cent. caustic soda solution can be utilised in the fusion stage, with kerosene (forming anhydrous crystal caustic soda *in situ*) with excellent yields, higher than those obtained with fused caustic.

Catalytic Sulphonation of Benzene

In a paper dealing with the vapour-phase catalytic sulphonation of benzene at atmospheric pressure, W. George Parks and Field H. Winslow, Rhode Island State College, Kingston, R.I., stated that they treated benzene vapour with sulphur trioxide gas in the presence of the heterogeneous catalysts silica gel, alfrax, and copper gauze. The reaction was controlled in an electrically heated calorised steel tube, which was surrounded by a bath containing a low-melting-point alloy. The effect of temperature (280° to 470° C.), time of contact (0.08 to 0.38 second), and sulphur trioxide-benzene ratio (0.3 to 4.1) on the yield of desirable products was studied. The basic catalytic activity of the reaction tube was determined. The maximum yield of benzene sulphonic acid calculated on the basis of the benzene passed was 49 per cent. at a temperature of 393° C. with a mole ratio of 3.8. Alfrax was a more efficient catalyst for the reaction than either silica gel or copper oxide, in that the formation of benzene sulphonic acid was favoured rather than the less desirable sulphone.

The optimum conditions for the sulphonation of benzene with low sulphone formation are a time of contact of approximately 0.2 second, a temperature of 360° to 370° C., and a mole ratio of 4. Under these conditions the yield of benzene sulphonic acid on the basis of the benzene passed through the apparatus was 60 to 70 per cent. together with 20 to 30 per cent. sulphone. An increase in temperature favoured the formation of the di- and tri-isomers. Sulphone formation is slightly favoured by silica gel catalysts. With a copper gauze catalyst at 355° C. and a mole ratio of 3.6 a yield of 86 per cent. benzene sulphonic acid was obtained. However, the undesirable sulphone was also formed to the extent of 21 per cent. of the benzene passed over the catalyst. Carbon deposits in the reaction chamber resulted from the instability of the di- and tri-sulphonic acids at elevated temperatures. If the reaction was carried out at reduced pressures this difficulty would be greatly if not entirely eliminated. Tarry residues and sulphones were difficult to avoid. They originated chiefly from oxidation and polymerisation reactions, and from the decomposition of the unstable high sulphonated benzene derivatives which form under certain conditions.

Personal Notes

As the result of a climbing accident on Tryfan mountain, MR. S. K. MORGAN, aged 30, of Avonmouth, an ironworks chemist, is detained in Bangor hospital with both legs broken.

The wedding took place last week at Ewood Methodist Church, Ewood, of MR. OSKAR GREEN and MISS LYDIA MOSS, of Ewood, Blackburn. Formerly a chemist in Darwen, Mr. Green is now engaged on important chemical research work for the Government near Birmingham.

MR. ERNEST HOLMES has been appointed projects' engineer with I.C.I., Ltd., at their Huddersfield works. He began his career as a draughtsman with Henry Balfour and Co., Ltd., Leven, and was later employed at the Fife Paper Mills, Ltd. Thereafter he went to Glasgow to take up an appointment with I.C.I.

MR. T. HARRY HEWLETT, chairman and managing director of the Anchor Chemical Co., Ltd., and of Joseph Anderson and Sons, Ltd., whose adoption as Conservative candidate for the Exchange Division of Manchester, was reported in our issue of September 14, was returned unopposed as M.P. for the Division last Saturday.

COUNCILLOR MRS. DOWBIGGIN, a leading worker in public affairs, who has been chosen to be next year's Mayor of Lancaster, is the wife of Mr. Dowbiggin, secretary of the chemical works of Messrs. Storey's, Ltd., Lancaster. Her husband also is actively identified with various local affairs and they are joint hon. secretaries of the Lancaster Branch of the League of Nations Union.

MR. W. EDMUND EVANS, A.R.C.S., B.Sc., F.I.C., of Mactaggart and Evans, Consulting Chemical Engineers, 14 Old Queen Street, London, S.W.1, has been appointed to a commission in the R.A.S.C., and took up his duties last Monday. His partner, Mr. E. F. Mactaggart, is carrying on their consulting practice with his assistants until Mr. Evans is able to rejoin him.

OBITUARY

MR. T. C. ATKINSON, M.P.S., managing director of Bleasdale, Ltd., manufacturing chemists, died recently at York.

MR. FRANK PARKYN, who died at St. Austell recently at the age of 90, had for over 60 years been one of the most enterprising and energetic figures in the Cornish china-clay industry, and was one of the industry's pioneers. He was a founder of the famous china-clay firm of Parkyn and Peters, and all the firms in the trade were represented at his funeral in St. Mewan churchyard last week.

The death of MR. J. V. W. MATHERS, one of the best-known metallurgical chemists in Australia, at the age of 63, has recently been reported from Perth, W.A. Mr. Mathers was business manager of Western Mining Corporation, Ltd. He was known to a large circle of Australian mine experts and metallurgists from his lectures on chemistry, metallurgy, and assaying at the Stawell School of Mines, and as a member of the Australian Institute of Mining and Metallurgy.

New Control Orders

Plastics

UNDER the Control of Plastics (No. 1) Order, 1940, made by the Minister of Supply, no person shall sell, buy, treat, use or consume, as from October 1 next, without a licence granted by the Minister of Supply, any plastics in the form of moulding powder, in the production of which any of the following materials has been used: formaldehyde, phenol, cresol, urea, thiourea or cellulose acetate.

Recent Trade Literature

The new Home Office order which provides that a fire watcher must be on duty at all times in premises where more than 30 people work gives added point to literature issued by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, on the subject of fire alarm systems. The literature describes modern alarm systems to meet the wartime fire menace and points out that existing house telephone systems can be adapted for this purpose.

Raw producer gas is hot as it leaves the producer and contains impurities which prevent it being used for the firing of furnaces fitted with small orific burners and requiring accurate temperature control. Two systems of producer gas cleaning, by which, it is claimed, any degree of cleanliness may be obtained in the gas produced, are described and illustrated in a brochure issued by the WHESSOE FOUNDRY AND ENGINEERING CO., LTD., Darlington.

In recent years reasons have been put forward why grating spectrographs might receive more attention from those interested in spectrochemical analysis. To meet the requirements of analysts inclined to prefer such instruments to the quartz spectrograph, a grating spectrograph has been specially designed for this type of work and is described in literature issued by ADAM HILGER, LTD., 98 St. Pancras Way, Camden Town, N.W.1. Other literature sent out by the same firm describes the Spekker Photoelectric Absorptiometer for colorimetric analysis in metallurgical laboratories and a new series of alloys of industrial importance to serve as primary standards in spectrochemical analysis.

WORTHINGTON-SIMPSON, LTD., engineers, Newark-on-Trent, have issued Bulletin WS. 1803, dated July, 1940, describing and illustrating the two-inch-stroke horizontal triplex single-acting enclosed-type power pump which they have recently developed. These machines can be used for any service where a small quantity of water at high pressure is required. They are claimed to be ideal for producing a high velocity jet for washing purposes and are also suitable for feeding small boilers. Among the main features of design are the following: totally enclosed crankcase, self-oiling, dust proof power end; crankcase holds a liberal supply of oil, making frequent renewal of oil unnecessary; main bearings are of large area, designed to carry full load with little wear and to require no adjustments; the whole of the driving parts in the crankcase can be easily and quickly withdrawn in one assembly, for inspection or replacements, by removing the crankcase cover and unbolting the main bearings.

New Commercial Alcohols

Anti-Foaming Agents

FOR the first time two normal primary alcohols that have been used extensively in the laboratory are being offered commercially by the E.I. du Pont de Nemours & Co. These are *n*-octanol and *n*-decanol. Their characteristics include good anti-foaming agents and a means of introducing octyl and decyl solvents into chemical manufacture. They may be used as mixed solvents for the extraction of fats and oils. Both alcohols have low solubility in water, but abate foam effectively within the limits 0.01 to 0.05 per cent. The specifications are given as follows: *n*-octanol, sp. gr. 25/25° C., 0.8225 to 0.8250; hydroxyl number, 430± 15; iodine number < 1; distillation range, A.S.T.M. method, 90 per cent. between 193° and 196° C.; *n*-decanol: sp. gr., 25/25° C., 0.8300 to 0.8380; hydroxyl number, 360± 15; iodine number, < 1; distillation range, A.S.T.M. method, 90 per cent. between 228° and 233° C. Both are water-white in colour.

THE FRENCH MINISTRY OF INDUSTRIAL PRODUCTION announces a soap ration of only 100 grams per person per month from October, a reduction of 25 grams from the present ration.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

ABSORPTION VESSELS for use in manufacture of acids and scrubbers in chemical plants.—W. Hawkyard and Son, Ltd., W. D. Crossley and W. H. Hawkyard. 5790.

PRODUCTION OF ALCOHOLS of acetylene series.—I. G. Farbenindustrie. (Germany, March 29, '39.) 5810.

MANUFACTURE OF BASIC ESTERS.—I. G. Farbenindustrie. (Germany, Sept. 10, '39.) 5917.

PREPARATION OF WATERPROOFING EMULSIONS.—L. Mellersh-Jackson (Bakelite Building Products Co., Inc.). (April 21, '39.) 5853.

ABSORBENT FOR ABSORBING EXCESS OF ALKALI METAL in vacuum tubes.—L. Klatzow. 5888.

PRODUCTION AND TREATMENT OF ORGANIC COMPOUNDS.—R. W. Moncrieff and E. W. Wheatley. 5907.

MANUFACTURE OF BUTADIENE.—A. L. Mond (Universal Oil Products Co.). 5998.

PRODUCTION OF AROMATIC HYDROCARBONS from mixtures of paraffins and cycloparaffins.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Holland, April 17, '39.) 5614.

MIXED ANHYDRIDES OF FORMIC ACID and acrylic and alpha substituted acrylic acids.—Norton Grinding Wheel Co., Ltd. (United States, April 1, '39.) 5632.

PRODUCTION OF ACRYLIC INTERPOLYMERS.—Norton Grinding Wheel Co., Ltd. (United States, April 1, '39.) 5632.

ABRASIVE WHEEL.—Norton Grinding Wheel Co., Ltd. (United States, March 29, '39.) 5725.

PRODUCTION OF HORMONE PREPARATIONS.—L. Paunz and G. Sasvari. (March 2, '39.) 5927.

TREATMENT OF WASTE MATERIAL coated with bitumen, etc.—P. Slanskey. 5784.

PROCESS FOR MANUFACTURING AGGLOMERATES from a coal base utilised as the only binder.—Soc. Financière de Transports et d'Enterprises Industrielles (Sofina) Soc. Anon. (Belgium, April 1, '39.) 5652.

MANUFACTURE AND APPLICATION of condensation products.—Soc. of Chemical Industry in Basle. (Nov. 3, '38.) (Switzerland, Nov. 5, '37.) 5666. (Nov. 3, '38.) (Switzerland, Jan. 4, '38.) (Cognate with 5606.) 5607. (Nov. 3, '38.) (Switzerland, Feb. 3,'38.) (Cognate with 5606). 5608. (Nov. 3, '38.) (Switzerland, Oct. 14, '38.) (Cognate with 5606.) 5609.

MANUFACTURE OF ESTERS OF AROMATIC SULPHOID-CARBOXYLIC ACIDS. Soc. of Chemical Industry in Basle. (Switzerland, April 4, '39.) 5811. (Switzerland, March 4.) (Cognate with 5811.) 5812.

MANUFACTURE OF CHLORIDES OF CARBOXYLIC ACIDS of high molecular weight.—Soc. of Chemical Industry in Basle. (Switzerland, April 25, '39.) 5813.

MANUFACTURE OF HYDROCARBON INTERPOLYMERS.—Standard Oil Development Co. (United States, April 13, '39.) 5666. (United States, April 21, '39.) (Cognate with 5666). 5667. (United States, Oct. 20, '39. (Cognate with 5666.) 5669..

MANUFACTURE OF SYNTHETIC COMPOSITIONS OF MATTER.—Standard Oil Development Co. (United States, April 29, '39.) 5670.

MANUFACTURE OF ORGANIC OXIDES.—Standard Oil Development Co. (United States, July 27, '39.) 5671.

PROCESSES FOR THE PRODUCTION OF METADIOXANES.—Standard Oil Development Co. (United States, July 1, '39.) 5673.

TREATMENT OF HYDROCARBONS.—A. H. Stevens (Phillips Petroleum Co.). 5721.

MANUFACTURE OF NITRIC ACID ESTERS.—A. H. Stevens (Sharpes Solvents Corporation). 5722.

EXOTHERMIC CATALYTIC REACTIONS.—Synthetic Oils, Ltd., and A. A. Aicher. 5831.

LUBRICATING OILS.—Texaco Development Corporation. (United States, April 4, '39.) 5749.

MANUFACTURE OF BUTADIENE.—Universal Oil Products Co. (United States, April 11, '39.) 5997.

PROCESS FOR CATALYTIC CONVERSION OF HYDROCARBON.—Universal Oil Products Co. (United States, March 22, '39.) 6038.

PRODUCTION OF AMMONIA SOLUTIONS.—Wallace and Tiernan, Ltd., and V. Wilmslow. 5710.

MEANS FOR SUPPLYING AIR AND STEAM to suction gas producers. J. D. Wishart. 6014.

Complete Specifications Open to Public Inspection

MANUFACTURE OF COLOURED ARTIFICIAL CELLULOSE TEXTILES, and pigments therefor.—Soc. Industrielle de Moy. Sept. 16, 1938. 32895/38.

MANUFACTURE OF ALIPHATIC AMINES.—E. I. du Pont de Nemours and Co. Sept. 28, 1938. 8618/39.

PROCESS FOR THE PRODUCTION OF PROTECTIVE LAYERS on aluminium or aluminium alloys or magnesium or magnesium alloys. Magnesium Elektron, Ltd. June 28, 1938. 13006/39.

PROCESS FOR THE REVIVIFICATION OF DECOLORISING ADSORBENTS. Standard Oil Development Co. Sept. 27, 1938. 13488/39.

TREATMENT OF BLACK LIQUOR SOAP.—American Cyanamid Co. June 8, 1938. 15856/39.

ACYLATED *p*-AMINOBENZYL AMINES and their quaternary derivatives.—J. R. Geigy A.-G. June 10, 1938. (Cognate Application, 17006/39.) 17005/39.

OXIDATION OF HYDRO-AROMATIC COMPOUNDS.—Henkel and Cie, Ges. Sept. 20, 1938. 19475/39.

PRODUCTION OF ACROLEIN.—Acrolein Corporation. June 27, 1938. 19897/39.

REFINING OF OILS AND FATS.—Lever Bros. and Unilever, Ltd. Sept. 30, 1938. 20129/39.

PROCESSES OF PRODUCING A VITAMIN E CONCENTRATE and/or antioxidant from wheat germ oil, and the products resulting therefrom.—General Mills, Inc. Sept. 24, 1938. 20566/39.

PROCESSES OF PRODUCING VITAMIN EMULSIONS, and the improved vitamin emulsions resulting therefrom.—General Mills, Inc. Sept. 22, 1938. 20567/39.

SULPHUR-CONTAINING CONDENSATION PRODUCTS.—Silesia Verein Chemischer Fabriken. July 28, 1938. 21012/39.

PROCESSES OF REACTING ORGANIC COMPOUNDS with the aid of a halide catalyst.—Colgate-Palmolive-Peet Co. July 26, 1938. 21564/39.

MANUFACTURE OF 3-ARYL-AMINOTETRAHYDROFURANES.—I. G. Farbenindustrie. Sept. 19, 1938. 21841/39.

NICKEL ANODES.—Mond Nickel Co., Ltd. Aug. 16, 1938. 22014/39.

TREATMENT OF LIQUID ZINC AMALGAMS.—I. G. Farbenindustrie and Duisbanger Kupperhutte. Sept. 21, 1938. 22437/39.

MANUFACTURE OF DYESTUFFS of the phthalocyanine series.—I. G. Farbenindustrie. Aug. 9, 1938. 22562/39.

MANUFACTURE AND PRODUCTION OF MOLYBDENUM CARBONYL.—I. G. Farbenindustrie. Aug. 12, 1938. (Cognate Application, 22990/39.) 22989/39.

PRODUCTION OF BRANCHED DIOLEFINES.—I. G. Farbenindustrie. Aug. 17, 1938. 22991/39.

PRODUCTION OF VALUABLE ORGANIC ACIDS.—E I. du Pont de Nemours and Co. Aug. 17, 1938. 23775/39.

METHOD FOR HOMOGENEOUSLY COMBINING BASE MATERIALS of all kinds with nitro varnish and colour films.—M. Robitschek. Aug. 23, 1938. 24250/39.

PROCESS OF INCREASING THE AFFINITY OF CELLULOSE FIBRES towards wool dyestuffs.—I. G. Farbenindustrie. Aug. 23, 1938. (Cognate Application 24316/39.) 24315/39.

PROCESS FOR THE MANUFACTURE of acetyl-dl-*a*-tocopherol.—F. Hoffmann-La Roche and Co. A.-G. Sept. 29, 1938. 24676/39.

MANUFACTURE OF AZO DYESTUFFS.—I. G. Farbenindustrie. Sept. 19, 1938. 24842/39.

PREPARATION AND TREATMENT of cellulosic esters.—R. Charbin. Sept. 19, 1938. 24920/39.

PREPARATION OF ORGANIC SULPHONATES.—Colgate-Palmolive-Peet Co. Sept. 17, 1938. 25572/39.

MANUFACTURE OF POLYMERIC MATERIALS.—Imperial Chemical Industries, Ltd. Sept. 19, 1938. 26030/39.

PROCESS OF POLYMERISING ROSIN, and the product resulting therefrom.—Newport Industries, Inc. Sept. 28, 1938. 26219/39.

MANUFACTURE OF AGENTS for improving the fastness of directly-dyed cellulose fibres.—J. R. Geigy, A.-G. Sept. 22, 1938. (Cognate Application 26327/39.) 26326/39.

FILTERS.—Dorr Co., Inc. Sept. 30, 1938. 26342/39.

MANUFACTURE OF AMINONITRILES.—Imperial Chemical Industries, Ltd. Sept. 24, 1938. 26349/39.

CONCENTRATION OF METALLIFEROUS ORES by flotation.—Minerals Separation, Ltd. Sept. 24, 1938. 26469/39.

PRODUCTION OF AMINES.—E. I. du Pont de Nemours and Co. Sept. 29, 1938. 26507/39.

CHEMICAL PROCESSES AND PRODUCT.—E. I. du Pont de Nemours and Co. Sept. 29, 1938. 26598/39.

PRODUCTION OF LACTAMS by the re-arrangement of cyclic ketoximes.—E. I. du Pont de Nemours and Co. Sept. 29, 1938. 26599/39.

PROCESS FOR THE PRODUCTION OF GLYCERINE.—B. Parodi-Delfino. Sept. 23, 1938. (Cognate Application 26607/39.) 26606/39.

MANUFACTURE OF COMPOUNDS of the cyclopentanopolyhydrophenanthrene series.—Soc. of Chemical Industry in Basle. Sept. 30, 1938. (Cognate Applications 26871 2/39.) 26670/39.

MOULDING OF POLYMERIC MATERIALS.—E. I. du Pont de Nemours and Co. Sept. 30, 1938. 26680/39.

MANUFACTURE OF SHAPED ARTICLES from polymeric materials.—E. I. du Pont de Nemours and Co. Sept. 29, 1938. 26681/39.

POLYMANIDE COMPOSITIONS.—E. I. du Pont de Nemours and Co. Sept. 29, 1938. 26682/39.

TREATMENT OF POLYMERIC MATERIALS.—E. I. du Pont de Nemours and Co. Sept. 29, 1938. 26810/39.

PROCESS FOR COATING SURFACES.—E. I. du Pont de Nemours and Co. Sept. 29, 1938. 26811/39.

POLYMERIC MATERIALS.—E. I. du Pont de Nemours and Co. Sept. 29, 1938. 26814/39.

MANUFACTURE OF SYNTHETIC WOOL.—E. I. du Pont de Nemours and Co. Sept. 29, 1938. 26815/39.

General News—From Week to Week

THE TEMPORARY *office* address of Metallurgical Chemists, Ltd., is 68 Highfield Avenue, London, N.W.11 (Tel.: SPEedwell 9064).

THE COPPER DEVELOPMENT ASSOCIATION has removed its offices, formerly in Thames House, to Grand Buildings, Trafalgar Square, London, W.C.2. Tel.: ABBey 2677.

THE BRITISH ALUMINIUM CO., LTD., inform us that their address from September 30 will be Oakley Manor, Belle Vue, Shrewsbury, not Belle Vue Road, as they previously stated.

FOR THE TIME BEING the Library of the Chemical Society will be closed on Saturdays. So far as circumstances permit it will be open on other weekdays from 10 a.m. to 5 p.m.

MESSRS. L. R. B. PEARCE AND CO., LTD., chemical merchants, have moved from 50 Mark Lane to 25 The Chine, Winchmore Hill, London, N.21, where all communications should be addressed (Tel.: LABurnum 3505).

THE FORMATION OF A NEW ORGANISATION, to be known as the "Coventry Textile Society," was decided on at the opening meeting of the winter programme of the Midland Section of the Textile Institute, held at Coventry last Saturday.

IT HAS BEEN DECIDED that purchases of rosin from France in 1939 shall be taken into consideration in the settlement of future quotas and certified returns of importers' purchases from France in the year ended August 31, 1939.

IN ORDER TO EXTEND THE USES of wrought light aluminium alloys, principal manufacturers have applied to the Board of Trade for a new trade organisation, to be known as the Wrought Light Alloys Development Association.

IT IS PROPOSED to lay before the House of Commons a draft list more particularly defining "essential drugs of an exceptionally costly character" which shall be exempted from Purchase Tax.

PROFESSOR W. WYNN JONES, of University College, Dundee, addressing a conference of the Association of Scientific Workers in Glasgow on September 21, expressed the opinion that science should be organised in each of its three main branches—teaching, research and industry.

FOLLOWING THE ARRIVAL in this country of 750 bottles of mercury from the United States, a perceptible easing in the situation is reported. Although the London spot quotation is maintained at £54 10s., business has, in some instances, been arranged at £52 10s. Further arrivals, both from America and China, are expected shortly.

AMONG THE CHANGES ANNOUNCED in the Schedule of Reserved Occupations is one affecting men listed under the heading "Scientific Worker, Research Worker." Those who volunteer may now, irrespective of age, be accepted for general service in the Forces, subject to the consent of the Scientific Research Committee of the Central Register Advisory Council.

THE REGISTERED OFFICE and warehouse of Messrs. A. Gallenkamp and Co., Ltd., remain at 17-19 Sun Street, Finsbury Square, London, E.C.2, but temporary offices have been obtained at Birkbeck College (University of London), Birkbeck Avenue, Greenford, Middlesex. The factory is at Worsley Bridge Road, Lower Sydenham, S.E.26.

Foreign News

AMMONIUM CHLORIDE, the manufacture of which was commenced recently in the Punjab, has been added to the list of chemicals now produced in India.

THE BRITISH GOVERNMENT has agreed to purchase Indian linseed at minimum price of £12 10s. per ton f.o.b. and Indian groundnuts at minimum price of £10 per ton f.o.b.

EXPORTS OF ACETONE from the United States during the first six months of 1940 rose to 12,128,410 lb., from 8,159,890 lb. in the same period of 1939, and 3,988,848 lb. for the 1938 months.

CANADIAN CREOSOTE OIL exports dropped considerably last year to 154,543 gals. from 731,099 gals. in 1938. For the first quarter of this year, exports totalled 30,911 gallons, or about three-fourths of those for January-March, 1939. The U.S.A. controls entirely this branch of Canadian export trade.

EXPORTS FROM THE UNITED STATES of sodium chromate and bichromate rose from 2419 short tons in 1938 to 5428 in 1939. Preliminary returns for the first half of 1940 disclose total exports of 7143 tons.

THE OUTPUT OF BY-PRODUCT SULPHURIC ACID at copper and zinc plants in the U.S.A. in 1939, in terms of 60° Bé. acid, amounted to 778,441 short tons, of which 249,569 tons were produced at copper plants and 528,872 tons at zinc plants, according to the Bureau of Mines, U.S. Department of the Interior. The acid reported is only that produced from the sulphur content of the sulphide ores. In addition to these quantities 102,663 tons of sulphuric acid were made at zinc plants from 26,500 tons of sulphur, indicating a large increase in the use of sulphur for promoting acid recovery at zinc plants over the low rate of 1938. No sulphur was used at copper plants.

Forthcoming Events

A MEETING OF THE INSTITUTE OF FUEL will be held on October 8 at 2.15 p.m. in the Connaught Rooms, Great Queen Street, London, W.C.2, when a paper will be presented by Mr. W. Boon, of the London and Counties Coke Association, entitled "Some Thoughts on Coke," which will be followed by a discussion. The above meeting will be preceded at 12.40 for 1.10 p.m. by an informal luncheon in the same room, to which members can bring guests. The charge for lunch will be 5s. per head, which must be paid at the table. No tickets will be issued, but members are requested to advise the secretary of their intention to be present so that adequate accommodation can be provided.

AT 2.15 P.M. ON OCTOBER 17, in the Connaught Rooms, Great Queen Street, London, W.C.2., a meeting of the Institute of Fuel will be held when Mr. W. M. Selvey, M.I.C.E., M.I.Mech.E., M.I.E.E. (who has been acting president during Lt.-Colonel J. H. M. Greenly's absence abroad), will present an address to the members present. It is hoped that the president will be in the chair and announce the name of the Melchett Medallist for the current year and present the Student's Medal for 1940. The above meeting will be preceded at 12.40 for 1.10 p.m., by an informal luncheon in the same place, to which members can bring guests. Ladies will be very welcome. The charge for lunch will be 6s. 6d. per head (including gratuities to the waiters) which must be paid at the table.

A Chemist's Bookshelf

PHYSICAL ORGANIC CHEMISTRY. By Louis P. Hammett, Ph.D. London: McGraw-Hill. Pp. 404. 26s.

This book, belonging to the International Chemical Series, deals principally with reaction rates, equilibria and mechanisms in physical organic chemistry. Under this name the author includes the investigation of the phenomena of organic chemistry by quantitative and mathematical methods. The theories and principles are the author's own, mainly collected from widely-scattered periodical articles which are mentioned in footnotes, and they summarise the development of this special subject from its appearance to the most recent time. The book will be of practical value, both to students and to advanced practitioners.

QUANTITATIVE ANALYSIS. By Harold Simmons Booth, Ph.D. and Vivian Richard Damerell, Ph.D. London: McGraw-Hill. Pp. 246. 15s.

This is another volume in the International Chemical Series, intended for use in the elementary quantitative analysis course that normally follows qualitative analysis. The laboratory experiments and directions deal for the most part with the determination of common elements and radicals, and therefore gravimetric analysis is given before the volumetric methods. The various quantitative problems are described in 43 chapters and, to assist the student, examination questions are placed at the end of each chapter. A section of 23 tables completes the book, which will be most welcome to teachers as well as to students.

Weekly Prices of British Chemical Products

TAKING the general chemical market as a whole conditions are steady with a fair weight of fresh business in evidence in most sections. Makers' deliveries against contract specifications are regarded as satisfactory, and although a number of potash materials are available only for approved requirements there is no acute shortage of supplies, either here or in other directions. A steady demand is reported for most of the soda products, chlorates and heavy acids for both home and overseas destinations, with values firm and unchanged at recent quotations. Movements in the market for coal tar products have been on the quiet side with considerable room for improvement in the demand both for home and export. Creosote and solvent naphtha are steady and unchanged whilst interest in cresylic acid and crude carbolic acid is reported slow. Quotations for pitch are more or less on a nominal basis with values elsewhere about steady.

MANCHESTER.—A fair demand for chemicals, chiefly against existing commitments, for the textile bleaching, dyeing and finished trades, has been reported on the Manchester market during the past week, whilst most of the other principal using trades in Lancashire have also been taking fair quantities. New business has been moderately active, with values pretty well throughout the range on a steady basis. In the tar products market an easy undertone continues in evidence in crude carbolic acid, cresylic acid and pyridine, but the other leading by-products are mostly firm and are being called for in fair quantities.

GLASGOW.—Taking the Scottish heavy chemical market as a whole, business is quite up to preceding weeks, and nowhere are there any serious complaints as to delay in delivery of orders. When delays do occur those interested are quite sympathetic when the facts or the position are placed before them. Prices are still well maintained, and the tendency, in a number of chemicals, is inclined to higher levels.

Price Changes

Rises: Tartaric Acid.

Falls: Aluminium Sulphate; Cresylic Acid (Manchester); Lactic Acid, dark tech.; Magnesium Chloride.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton £36 10s.; 10 cwt./1 ton, £37 10s.; 4/10 cwt., £38 10s.; 80% pure, 1 ton, £38 10s.; 10 cwt./1 ton, £39 10s.; 4/10 cwt., £40 10s.; commercial glacial, 1 ton, £46; 10 cwt./1 ton, £47; 4/10 cwt., £48; delivered buyers' premises in returnable barrels. £4 per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 50 tons and over, £52 10s.; 10/50 tons, £53; 5/10 tons, £53 10s.; 1/5 tons, £54; single drums, £55, delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each; delivered in containers of less than 45 gallons but not less than 10 gallons £10 10s. per ton in excess of maximum prices; delivered in containers less than 10 gallons each £10 10s. per ton in excess of maximum prices, plus a reasonable allowance.

Alum.—Loose lump, £9 10s. per ton, d/d, nominal.

Aluminium Sulphate.—£8 to £8 10s. per ton d/d.

Ammonia Anhydrous.—99.95%, 1s. to 2s. per lb., according to quantity in loaned cylinders, carriage paid; less for important contracts.

Ammonium Carbonate.—£32 to £36 per ton d/d in 5 cwt. casks.

Ammonium Chloride.—Grey galvanising, £18 per ton, in casks, ex wharf. See also Salammoniac.

Antimony Oxide.—£68 per ton.

Arsenic.—99/100%, about £30 per ton, ex store.

Barium Chloride—98/100%, prime white crystals, £11 10s. 0d. to £13 per ton, bag packing, ex works; imported material would be dearer.

Bleaching Powder.—Spot, 35/37%, £9 10s. to £10 per ton in casks, special terms for contract.

Borax, Commercial.—Granulated, £23; crystals, £24; powdered, £24 10s.; extra fine powder, £25 10s.; B.P. crystals, £32; powdered, £32 10s.; extra fine, £33 10s. per ton for ton lots, in free 1 cwt. bags, carriage paid in Great Britain. Borax Glass, lump, £68; powder, £69 per ton in tin-lined cases for home trade only, packages free, carriage paid in Great Britain.

Boric Acid.—Commercial, granulated, £37 10s.; crystals, £38 10s.; powdered, £39 10s.; extra fine, £41 10s.; large flakes, £50; B.P. crystals, £46 10s.; powdered, £47 10s.; extra fine powdered, £49 10s. per ton for ton lots in free 1-cwt. bags, carriage paid in Great Britain.

Calcium Bisulphite.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/75% solid, £5 10s. per ton ex store.

Charcoal Lump.—£10 10s. to £14 per ton, ex wharf. Granulated, supplies scarce.

Chlorine, Liquid.—£19 15s. per ton, d/d in 16/17 cwt. drums (3-drum lots); 4¾d. per lb. d/d station in single 70-lb. cylinders.

Chrometan.—Crystals, 4½d. per lb.; liquor, £19 10s. per ton d/d station in drums. GLASGOW: Crystals 4d. per lb. in original barrels.

Chromic Acid.—1s. 2d. per lb., less 2½%; d/d U.K. GLASGOW: 1s. 0¼d. per lb. for 1 cwt. lots.

Citric Acid.—1s. 2d. per lb. MANCHESTER: 1s. 6d.

Copper Sulphate.—About £29 per ton d/d.

Cream of Tartar.—100%, £7 12s. per cwt., less 2½%, d/d in sellers' returnable casks; imported material would be dearer.

Formic Acid.—85%, £44 10s. per ton for ton lots, carriage paid, carboys returnable; smaller parcels quoted at 46s. 6d. to 49s. 6d. per cwt., ex store.

Glycerine.—Chemically pure, double distilled, 1,260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, 1s. 4d. per lb.; free-running crystals are quoted at 1s. 7½d. to 1s. 10½d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 6s. 1½d. to 8s. 7½d. carboy d/d according to purity, strength and locality.

Iodine.—Resublimed B.P., 9s. 2d. to 13s. per lb., according to quantity.

Lactic Acid.—Dark tech., 50% by vol., £31 per ton; 50% by weight, £38; 80% by weight, £67; pale tech., 50% by vol., £39 10s.; 50% by weight, £46, 80% by weight, £74. Not less than one ton lots ex works; barrels returnable, carriage paid.

Lead Acetate.—White, £48 to £50, ton lots.

Lead Nitrate.—About £45 per ton d/d in casks.

Lead, Red.—English, 5/10 cwt. £42; 10 cwt. to 1 ton, £41 15s.; 1/2 tons, £41 10s.; 2/5 tons, £41; 5/20 tons, £40 10s.; 20/100 tons, £40; over 100 tons, £39 10s. per ton, less 2½ per cent. carriage paid; non-setting red lead 10s. per ton dearer in each case. Continental material £1 per ton cheaper.

Lead, White.—Dry English, less than 5 tons, £51 10s.; 5/15 tons, £47 10s.; 15/25 tons, £47; 25/50 tons, £46 10s.; 50/200 tons, £46 per ton less 5 per cent. carriage paid; Continental material £1 per ton cheaper; ground in oil, English, 1/5 cwt., £60; 5/10 cwt., £59; 10 cwt. to 1 ton, £58 10s.; 1/2 tons, £57; 2/5 tons, £56; 5/10 tons, £54; 10/15 tons, £53; 15/25 tons, £52 10s.; 25/50 tons, £52; 50/100 tons, £51 10s. per ton less 5 per cent. carriage paid. Continental material £2 per ton cheaper.

Litharge.—1 to 2 tons, £41 10s. per ton.

Lithium Carbonate.—7s. per lb. net.

Magnesite.—Calcined, in bags, ex works, £14 to £17 per ton

Magnesium Chloride.—Solid (ex wharf), £10 to £13 per ton.

Magnesium Sulphate.—Commercial, £12 to £14 per ton, according to quality, ex works.

Mercury Products.—Controlled price for 1 cwt. quantities: Bichloride powder, 12s. 3d.; bichloride lump, 12s. 10d.; ammon. chloride powder, 14s. 2d.; ammon. chloride lump, 14s.; mercurous chloride, 14s. 7d.; mercury oxide, red cryst., B.P., 16s. 4d.; red levig. B.P., 15s. 10d.; yellow levig. B.P. 15s. 9d.

Methylated Spirit.—Industrial 66 O.P. 100 gals., 2s. 0½d. per gal.; pyridinised 64 O.P. 100 gals., 2s. 1½d. per gal.

Nitric Acid.—S.G. 1420, £28 10s. to £29 10s. per ton ex works.

Oxalic Acid.—From £59 5s. per ton for ton lots, carriage paid, in 5-cwt. casks; smaller parcels would be dearer; deliveries slow.

Paraffin Wax.—Nominal.

Potash, Caustic.—Solid, 88/92%, commercial grade, £53 7s. 6d. per ton, c.i.f. U.K. port, duty paid.

Potassium Bichromate.—Crystals and granular 6d. per lb.; ground, 7d. per lb., carriage paid.

Potassium Carbonate.—Hydrated, 83/85%, £46 17s. 6d. per ton; calcined, 98/100%, £52 2s. 6d. per ton, c.i.f. U.K. port.

Potassium Chlorate.—Imported powder and crystals, ex store London, 10d. to 1s. per lb.

Potassium Iodide.—B.P., 8s. to 11s. 2d. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, £26 to £30 per ton ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 4½d. to 1s. 5½d. per lb.; commercial, £7 9s. 6d. to £8 1s. 6d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, about 1s. 2d. to 1s. 5d. per lb., supplies scarce.

Salammoniac.—Dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £16 10s. per ton, in casks, ex store.

Soda, Caustic.—Solid, 76/77% spot, £14 10s. per ton d/d station.

Soda Crystals.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

Sodium Acetate.—£37 to £40 per ton, ex wharf.

Sodium Bicarbonate.—About £10 10s. to £11 10s. per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 5d. per lb., anhydrous, 6d. per lb. net d/d U.K. GLASGOW: 5¾d. per lb., carriage paid.

Sodium Bisulphite Powder.—60/62%, £16 per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£34 to £43 per ton, d/d, according to quantity.

Sodium Hyposulphite.—Pea crystals, £17 15s. per ton for 2-ton lots; commercial, £13 10s. per ton. MANCHESTER: Commercial, £13 10s.; photographic, £17 10s.

Sodium Iodide.—B.P., for not less than 28 lb., 8s. 10d. per lb.; for not less than 7 lb., 10s. 9d. per lb.

Sodium Metasilicate.—£14 5s. per ton, d/d U.K. in cwt. bags.

Sodium Nitrate.—Refined, £10 to £11 per ton for 6-ton lots d/d.

Sodium Nitrite.—£20 per ton for ton lots.

Sodium Perborate.—10%, £4 12s. 6d. per cwt. d/d in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £17 per ton, delivered, for ton lots. Tri-sodium, £20 to £21 per ton d/d for ton lots.

Sodium Prussiate.—From 6¾d. per lb. ex store.

Sodium Silicate.—£9 15s. per ton, for 4-ton lots.

Sodium Sulphate (Glauber Salts).—£4 10s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground, Spot £4 3s. 6d. per ton d/d station in bulk. MANCHESTER: £4 5s.

Sodium Sulphide.—Solid 60/62%, Spot, £14 10s. per ton d/d in drums; crystals, 30/32%, £10 5s. per ton d/d in casks.

Sodium Sulphite.—Pea crystals, spot, £16 per ton d/d station in kegs; commercial, £11 per ton d/d station in bags.

Sulphur.—Finely powdered, £17 to £18 per ton d/d; precip. B.P., £3 9s. per cwt.

Sulphuric Acid.—168° Tw., £6 2s. 3d. to £6 13s. 3d. per ton; 140° Tw., arsenic-free, £4 7s. 6d. to £4 17s. 6d. per ton; 140° Tw. arsenious, £4 per ton; quotations naked at sellers' works.

Tartaric Acid.—2s. 8½d. per lb., less 5%, carriage paid for lots of 5 cwt. and upwards. Makers' prices nominal; imported material 2s. 3d. to 2s. 6d. per lb., ex wharf. MANCHESTER: 2s. 3d. per lb.

Zinc Oxide.—Maximum prices: White seal, £30 17s. 6d. per ton; red seal, £28 7s. 6d. d/d; green seal, £29 17s. 6d. d/d buyers' premises.

Zinc Sulphate.—Tech., about £25, carriage paid, casks free.

Rubber Chemicals

Antimony Sulphide.—Golden, 9½d. to 1s. 7d. per lb., according to quality. Crimson, 1s. 8d. to 2s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9½d. per lb.

Barytes.—Best white bleached, £6 13s. 6d. per ton.

Cadmium Sulphide.—5s. 5d. to 6s. 6d. per lb.

Carbon Black.—5d. to 7¾d. per lb., according to packing.

Carbon Bisulphide.—£32 5s. to £37 5s. per ton, according to quantity, in free returnable drums.

Carbon Tetrachloride.—£16 to £19 per ton.

Chromium Oxide.—Green, 1s. 6d. per lb.

India-rubber Substitutes.—White, 6¾d. to 8½d. per lb.; dark 5½d. to 6d. per lb.

Lithopone.—30%, £25 per ton; 60%, £31 to £32 per ton. Imported material would be dearer.

Mineral Black.—£10 to £14 per ton.

Mineral Rubber, "Rubron."—£16 to £18 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£30 to £55 per ton, d/d, according to quality.

Vermilion.—Pale or deep, 14s. 6d. per lb., for 7 lb. lots and less. Plus 5% War Charge.

Nitrogen Fertilisers

Ammonium Phosphate Fertilisers.—£14 11s. 9d. to £19 19s. 6d. per ton in 6-ton lots, September delivery, d/d farmer's nearest station.

Ammonium Sulphate.—£9 13s. 0d. per ton in 6-ton lots, September delivery, d/d farmer's nearest station.

Calcium Cyanamide.—£21 per ton, c.i.f., on 21 per cent. basis; supplies small.

Concentrated Complete Fertilisers.—£14 13s. 9d. to £14 19s. 3d. per ton in 6-ton lots, September delivery, d/d farmer's nearest station.

"Nitro-Chalk."—£8 18s. per ton in 6-ton lots, d/d farmer's nearest station, September delivery.

Coal Tar Products

Benzol.—Industrial (containing less than 2% of toluol), 2s. to 2s. 1d. per gal., ex works.

Carbolic Acid.—Crystals, 9½d. to 10¾d. per lb.; Crude, 60's 3s. 6d. to 4s., according to specification. MANCHESTER: Crystals, 10½d. per lb., d/d; crude, 4s. to 4s. 3d. naked, at works.

Creosote.—Home trade, 5½d. to 6d. per gal., f.o.r., makers' works; exports 6d. to 6¼d. per gal., according to grade. MANCHESTER: 5d. to 7d. per gal.

Cresylic Acid.—99/100%, 2s. 4d. to 3s. per gal., according to specification. MANCHESTER: Pale, 99/100%, 2s. 3d. per gal.

Naphtha.—Solvent, 90/160°, 1s. 10d. to 2s. per gal.; solvent, 95/160°, 1s. 11d. to 2s., naked at works. MANCHESTER: 90/160° 1s. 11d. to 2s. per gal.

Naphthalene.—Crude, whizzed or hot pressed, £10 to £11 per ton; purified crystals, £26 per ton in 2-cwt. bags; flaked, £27 per ton. Fire-lighter quality, £6 to £7 per ton ex works. MANCHESTER: Refined, £26 per ton.

Pitch.—Medium, soft, 50s. per ton (nominal) f.o.b. MANCHESTER: 50s. (nominal), f.o.b. East Coast.

Pyridine.—90/140° 17s. 6d. per gal.; 90/160°, 15s.; 90/180°, 4s. to 5s. per gal., f.o.b. MANCHESTER: 16s. 6d. to 20s. per gal.

Toluol.—Pure, 2s. 5d., nominal. MANCHESTER: Pure, 2s. 5d. per gal., naked.

Xylol.—Commercial, 2s. 9d. per gal.; pure, 2s. 11d. MANCHESTER: 2s. 11d. per gal.

Wood Distillation Products

Calcium Acetate.—Brown, £8 10s. to £10 per ton; grey, £13 to £14. MANCHESTER: Grey: £20.

Methyl Acetone.—40.50%, £42-£45 per ton.

Wood Creosote.—Unrefined, 2s. per gal., according to boiling range.

Wood Naphtha, Miscible.—4s. 6d. to 5s. per gal.; solvent, 5s. per gal.

Wood Tar.—£5 to £6 per ton, according to quality.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-**Cresol** 30/31° C.—8d. to 9d. per lb. in ton lots.

p-**Cresol** 34/35° C.—1s. 8d. to 1s. 9d. per lb. in ton lots.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb., in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—September 25.—For the period ending September 28 per ton, net, naked, ex mill, works or refinery, and subject to additional charges according to package and location of supplies:—LINSEED OIL, raw, £44. RAPESEED OIL, crude, £44 5s. COTTONSEED OIL, crude, £31 2s. 6d.; washed, £34 5s.; refined edible, £35 12s. 6d.; refined deodorised, £36 10s. SOYA BEAN OIL, crude, £33; refined deodorised, £37. COCONUT OIL, crude, £28 2s. 6d.; refined deodorised, £31 7s. 6d. PALM KERNEL OIL, crude, £27 10s.; refined deodorised, £30 15s. PALM OIL, refined deodorised, £33. GROUNDNUT OIL, crude, £35 10s.; refined deodorised, £40. WHALE OIL, crude hardened, 42 deg., £30 10s.; refined hardened, 42 deg., £33. ACID OILS.—Groundnut, £19; soya, £17; coconut and palm kernel, £22 10s. ROSIN, 25s. to 30s. per cwt., ex wharf, according to grade. TURPENTINE, 54s. per cwt., spot, American, including tax, ex wharf, barrels, and ex discount.

HULL.—September 21.—American turpentine, spot, 54s. per cwt. in barrels, ex store.

Chemical Future of South Africa

Developments Recommended

SURPRISE that more attention had not been paid to the raising of sugar cane in the Union of South Africa as a source of molasses for the chemical industry was expressed recently by Dr. J. A. Viljoen, technical manager of National Products, at Johannesburg. He knew of no field where there was greater waste of easily procured material that could be utilised. While the future was well assured from the standpoint of raw materials, the Union was at a decided disadvantage in having no operating men experienced in chemical industry. Motor fuel was the first outstanding need of the country, declared Dr. Viljoen. He considered that a motor fuel supply commission should start work at once to develop motor fuel from existing raw materials. Hydrogenation of coal and plant material should be studied in pilot plant. The first object should be the making of special high-priced materials such as aviation spirit and lubricating oils. At the same time, work should be carried on to utilise certain fractions for the manufacture of such organic chemicals as have an established market. The total gasification of coal followed by the recombination of the gases into new products should also be studied. The fermentation industries should be developed and the problem of paint, varnish and lacquer raw materials also needed attention.

OVERSEAS TRADE EXPANSION

August overseas trade returns show an encouraging expansion. Domestic exports at £32,600,000 are £1,400,000 higher than in July, indicating progress in the trade areas of the world still open to us. The increase in imports is larger—they amounted to £95,000,000 against £87,000,000—and, although this has the effect of swelling the adverse balance, it shows the continued ability of this country to ship essential raw materials and foodstuffs. At the same time, the restricting effect of import licensing is reflected in declines among certain non-essential manufactures. For the first year of the war the visible adverse balance of trade is £603,000,000, against £376,000,000 in the preceding 12 months.

Company News

William Blythe and Co., Ltd., have declared an interim dividend of 3 per cent., less tax, on ordinary shares (same as last year).

Benzol and By-Products, Ltd., continuing the payments on account of arrears of cumulative preference dividend, are paying a dividend of 3 per cent. on September 30 in respect of the six months ended March 31, 1939.

Sadler and Co., Ltd., announce the payment of a 5 per cent. dividend for the year to June 30, 1940. The previous payment was in 1937-38 and consisted of an interim of 3 per cent., less tax, a final of 3 per cent., less tax, and a special dividend of 6¼ per cent.

Murex, Ltd., manufacturers of tungsten powder and alloy, etc., is maintaining its ordinary distribution at 20 per cent., less tax, for the year to June 30, 1940. Yesterday the directors announced the payment of a final ordinary dividend of 10 per cent. actual, together with a cash bonus of 2½ per cent. Annual meeting on November 4.

Aspro, Ltd., announce a final ordinary dividend of 15 per cent., making 25 per cent., less tax, for the year ended June 30, 1940, the same as last year. Trading profit in the year to June 30 was £283,231, against £277,342, an increase of 5889, and net profit was £274,350, against £264,910. Meeting, Winchester House, E.C., October 7, at 2.30 p.m.

At the annual meeting of the **Triplex Safety Glass Co., Ltd.,** held on Wednesday, it was announced that the company's normal business practically ceased on the outbreak of war. Firm orders were cancelled and heavy stocks became almost valueless. Results for the year, however, were better than had been expected, and both factories were now running on a profit-earning basis. A dividend of 6d. per stock unit, less tax, was declared.

Chemical and Allied Stocks and Shares

THE rapidity with which the Stock Exchange and other city institutions are adapting their activities, to meet the changed conditions resulting from frequent air raids, has maintained a very steady undertone in the stock and share markets. Under the lead of the continued strength of Government securities, industrial and other shares have shown a firm tendency, and although price movements were moderate, they were mostly in favour of holders.

Imperial Chemical remained steady at 26s. on further consideration of the interim dividend, but the preference units were rather easier at 27s. 9d. B. Laporte were around 50s. and Greeff-Chemicals Holdings 5s. units kept at par, but were inactive. Monsanto Chemicals preference shares were again 21s. 3d., while in other directions, Fison Packard and Prentice changed hands at 27s. 6d. at one time. The recent interim statement of Cooper McDougall and Robertson created a satisfactory impression in the market and the ordinary shares changed hands up to 20s. 9d. Borax Consolidated were firm and held their recent improvement to 25s. 7½d., while the 4½ per cent. first debentures transferred around par.

In other directions, British Drug Houses changed hands at 20s. 9d. Reckitt ordinary were fairly active around 83s., while Cerebos kept at close on £7½. For some years the dividend of the latter company has been 40 per cent., and last year this was earned with a margin sufficient to have paid a further 11 per cent. Triplex Glass were close on 15s. following the statements at the annual meeting, while elsewhere, Canning Town Glass 5s. shares showed business around 4s. Demand for cement and allied companies' shares was again reported, and Associated Cement were 57s. 6d., while British Plaster Board 5s. units improved to 11s. Among iron and steel issues, United Steel were inclined to improve on further consideration of the dividend, and Dorman Long were slightly better, while Staveley remained firm at 38s. Wall Paper deferred were easier at 14s. 4½d., and Barry and Staines moved back to 22s. 6d., although Nairn and Greenwich were again 37s. 6d. The ordinary units of the Distillers Co. were very steady at 56s., and United Molasses, after reacting to 18s., recovered to 18s. 6d. Lever and Unilever were little changed at 20s. 3d., while the 8 per cent. preference were around 21s. 9d. British Oil and Cake Mills preferred ordinary were again 32s. 6d.

Dunlop Rubber continued to show small fluctuations, and at the time of writing are around 28s. 3d. Imperial Smelting improved to 8s. 9d. on further consideration of the payment on the preference shares, which indicated that earnings are now showing recovery, although it is not generally expected there will be an early return of the ordinary shares to the dividend list. General Refractories were slightly better at 6s. 3d. on the assumption that the activity in the steel industry is leading to increased demand for the company's products. British Aluminium and British Oxygen shares were inclined to improve, while there was a better tendency in Turner and Newall. Boots Drug were steady at 38s. 3d., and Beechams Pills deferred further improved to 7s. 10½d., awaiting the interim dividend announcement. Griffiths Hughes at 7s. 6d. also made a better price. Sangers were 18s. and Timothy Whites 17s. 3d. Among oil shares slightly better prices were made by "Shell" and Burmah Oil, while Trinidad Leaseholds were firm, and Trinidad Petroleum Development recorded a small gain.

New Companies Registered

Northern Charcoal Producers, Ltd. (363,286).—Private company. Capital: £100 in 100 ordinary shares of £1 each. Manufacturers of and dealers in charcoal, chemicals and patent fuels, wood and timber merchants, etc. Directors: Geo. F. Ward, 43 Gibwood Road, Northenden, Manchester; Thos. B. Hustler.

Lea Fertilities, Ltd. (363,242).—Private company. Capital £500 in £1 shares. Manufacturers and importers of and dealers in chemical, artificial and other fertilisers and manures, chemicals, salts, acids, etc. Directors: James F. Jones, "Elham," Middle Street, Nazeing, Essex; Harold C. Higgins.

Colloidal Research Laboratories, Ltd. (363,262).—Private company. Capital £100 in 100 shares of £1 each. Laboratory proprietors, wholesale and retail chemists and druggists, chemical engineers, etc. Subscribers: Sidney A. Pettifer, Walter H. Atkins. Acting secretary: Sidney A. Pettifer. Solicitors: Frere Cholmeley and Co., 28 Lincoln's Inn Fields, W.C.2. Registered Office: Ling House, Dominion Street, Moorgate, E.C.

High Duty Paints, Ltd. (363,265).—Private company. Capital £100 in 100 ordinary shares of £1 each. Manufacturers of and wholesale and retail dealers in paints, enamels, varnishes, colours, driers, lacquers, polishes, distempers, whitewashes, cellulose and colouring and preserving compounds and substances, etc. Directors: Francis J. Minett, Arthur F. Smith. Registered office: 37a Grant Road, Croydon, Surrey.